

ACCOMMODATING AGING POPULATION NEEDS IN AIRPORT TERMINALS

by

Harry P. Wolfe
Maricopa Association of Governments

July 10, 2003

This paper was based on research sponsored by the Volpe Center in Cambridge Massachusetts and the Federal Aviation Administration. The Volpe Center and the Federal Aviation Administration have unrestricted rights to the material in this paper, and should this paper be used in another context, no restriction will be placed on their use of the material.

ACKNOWLEDGMENTS

This research report could not have been prepared without the support and encouragement of many individuals. I extend my appreciation to: Zale Anis of the Volpe Center for providing me with the opportunity to prepare the report; Dr. Joseph Coughlin, Director of the Aging Lab at the Massachusetts Institute of Technology for his encouragement; Jeffrey Pike of Ford Motor Company for providing input on the changing mindset of baby boomers in their quest for independence; Bernie Deutsch of Deutsch and Associates for providing me with the insight of a practicing architect; Dr. Andrew Scharlach and Ms. Barrie Robinson of the University of California at Berkeley for sharing their course curriculum on the aging process; Dr. Reginald Golledge of the University of California Santa Barbara and Dr. Gary Allen of the University of Southern California for sharing their perspective and research on wayfinding issues confronted by seniors; Betsy Buxer of Arizona Easter Seals for her valuable perspective on the mobility challenges facing seniors; to Norbert Senftleben and Kit Weiss of Phoenix Sky Harbor Airport for facilitating my research efforts at the airport; and to Mark Smith of Denver International Airport and Jim Ritchie of Los Angeles International Airport for providing input on the preliminary results of my research.

BACKGROUND PROBLEM STATEMENT

Seniors are having problems using airports. Long walking distances, waiting in lines, and difficulties in wayfinding in terminals are anxiety provoking and can deter seniors from taking air trips and using airports.¹

Airport design professionals need to address these problems or as much as 20 percent of the United States air travel market could be negatively impacted by 2040.² The aging of the baby boomer generation will result in a burgeoning demand for air travel, and airports need to better position themselves to accommodate this lucrative market.

In 2000, 35 million seniors in the United States aged 65 and older took about 13 million air trips, or about 2 trips for every 5 seniors.³ The Census Bureau projects that by 2020, there will be 54 million people aged 65 or older in the United States, and by 2040, 77 million people.⁴ While this age cohort represented 12.4% of the population in 2000, it will represent 16 percent in 2020 and 20 percent in 2040.⁵

If seniors exhibit the same propensity to use air travel in 2020 as they did in 2000, there would be 21 million air trips taken by seniors.⁶ Chances are, however, seniors' propensity to use air travel will increase, simply because seniors are healthier and more familiar with air travel than their predecessors. A mere 30% increase in senior air trips would result in 6 million more trips a year, and a potential additional \$120 million and \$900 million in airport and airline revenue respectively.⁷

The degree to which the senior's air trips can be increased, depends in part on the extent to which terminals can be adapted to be more conducive to use by seniors. While some airport professionals have suggested that the implementation of Americans with Disabilities Act (ADA) standards will address the needs of seniors, the senior market is quite distinct from the disabled population.⁸

Seniors cherish their independence and do not want to be viewed as disabled. Thus, while a wheel chair may solve the problem of long walking distances for a disabled person, it is not a panacea for the wave of seniors that will be flooding the air travel market in the years to come. An important distinction between a disabled individual and a senior is that the disabled person is generally aware of his/her limitations, while the limitations aging imposes upon seniors is more gradual, may go unnoticed and is often denied.⁹

A senior researcher at the Ford Motor Company notes the value that baby boomers place on being independent as follows: "Baby Boomers, as a group, have become accustomed to strongly influencing society and tend to be an assertive, forward-thinking portion of the population. They're accustomed to being independent and influential and have a vision of aging that is very different from that of their parents. As they mature, they will respond to changes that will assist them in maintaining their independence and achieving their vision of aging."¹⁰

Ford Motor Company's interest in accommodating the needs of seniors has led the company to develop a "Third Age Suit" for its young ergonomics engineers to simulate the physiological

constraints that a senior typically encounters. When the engineers wear the suit, they obtain a better understanding of the unique needs of seniors that can be applied to the design of their vehicles.¹¹

REQUIREMENTS OF SENIOR AIR TRAVELERS

Two methods were used to define the requirements of senior air travelers. One was to review the literature on the aging process and to draw inferences on the implications of aging on the ability of seniors to use airport terminals. The second was to solicit input directly from seniors through a focus group and individual interviews.¹²

A wealth of information on the impacts of the aging process on human functioning is readily available. The Baltimore Longitudinal Study¹³ and the MacArthur Foundation Study on Aging,¹⁴ for example, clearly track the changes that accompany aging in healthy adults. Courses of social work and geriatrics at major universities such as the University of California at Berkeley deal extensively with the physiological and psychological changes that aging brings about.¹⁵ A large body of research has been compiled on the way finding challenges experienced by seniors, some of it specifically addressing wayfinding issues at airports.¹⁶

Table 1 summarizes the typical changes experienced by a healthy person as he/she ages, the impacts of those changes on human functioning and the implications for airport terminal design. The objective of the table is to summarize a portion of the voluminous amount of research on aging and define some of the key physiological and psychological decrements experienced by older persons. By conveying this information to airport design professionals simply and concisely, they will be more likely to understand the needs of seniors and to take these needs into account in terminal design.

A parallel effort to help define the problems confronted by seniors at airports was achieved by conducting a focus group at Phoenix Sky Harbor Airport on February 22, 2002.¹⁷ The subjects were members of the “Navigators” a volunteer group that provides customer assistance to passengers in the terminals. These people had a wealth of information on the problems confronted by seniors at the airport, based on their daily on-the-job experiences. In addition, many of the “navigators,” were older and retired themselves giving them even more insight.

After independently listing the major concerns of seniors at airport terminals, focus group subjects used a collaborative process to summarize their findings. The three major problems identified through this process were: way finding, walking and waiting. The outcome of the focus group collaboration reinforced the results of the research on aging and its implications for terminal design.

During interviews with seniors at Terminal 4 at Sky Harbor International Airport in December 2002, concerns were also expressed regarding walking distances, prolonged waiting and way finding.

Table 1
Summary of Changes that Accompany Aging, Impacts on Human Functioning and
Implications For Airport Design

Description of Change	Impacts of Change on Human Functioning	Implications of Change on Airport Terminal Design
Decrease in size of eye's pupil and coloration of lens	A person of 60 requires triple the illumination to see as a 20 year old; it becomes more difficult to distinguish certain colors and color combinations	Choice of color hue, lightness and saturation for "You are here maps" and terminal accouterments are important to way finding. Terminal lighting needs enhancements.
Changes in bones in the ear results in greater difficulty in transmitting sound	About 30 percent of seniors may have some hearing loss	Audible announcements may need to be accompanied by text; terminal acoustics need improvement.
Impairment of shoulder joint because of arthritis, occupational trauma and disuse	Reduced range of motion (ROM), lessens grip strength and endurance.	Hauling baggage through terminals, even on wheels, and retrieving baggage can be difficult.
Decline in hand functioning due to arthritis, neurological impairment, vascular disease and trauma	Reduction in grasp and pinch function	Makes it more difficult to use terminal vending machines, to haul baggage over long distances, and to retrieve items from a wallet or purse for airport security.
Impairments to gait and balance due to changes in neuromuscular systems	Makes seniors more susceptible to falls	Moving sidewalks, stairs and escalators pose hazards to seniors.
Loss of brain cells impairs cognitive skills	Takes longer to process information and draw inferences; heightens anxiety associated with the unknown	Terminal signage and "you are here" maps need to be as simple and easy to interpret as possible.

Decrements in Cardio-vascular system such as deterioration of heart muscle and hardening of arteries. Results in reduced blood flow to body	Reduced stamina	Makes it more difficult to traverse long distances or to stand for a prolonged period of time.
Reduction in efficiency of respiratory system	Reduced stamina with shortness of breath and fatigue; lack of oxygen can increase anxiety	Makes standing and walking more difficult and makes way finding more anxiety provoking
Change in personality results in increased introspection and greater cautiousness	Unwillingness to venture out and take risks	Makes seniors more sensitive to the complexities of traversing terminals and acts as a deterrent to travel.

Sources: Mayo Clinic, Rochester Minnesota,¹⁸ Dr. Andrew Scharlach and Ms. Barrie Robinson, University of California Berkeley¹⁹

ASSESSMENT OF AIRPORT TERMINAL AREAS

Based upon the research conducted, airport terminals were evaluated with respect to the needs and requirements of senior travelers. What follows is an evaluation of the terminal in terms of the various functions and activities performed by the senior passenger.

Instructions and Way finding

While way finding in airport terminals can pose a challenge for all air travelers, research indicates that way finding in general is more challenging for older adults, and the risk of disorientation higher.²⁰

Most airports rely on “You are Here” maps to facilitate way finding. To be of legitimate use to seniors, care needs to be taken regarding a number of factors, including, but not limited to:

- Placement - typically placed before you reach the concourse. Should also be placed near ticket counters or curbside check-in.
- Orientation - the maps need to be oriented with the axis of the environment. A different orientation of the map requires transposing directions on the part of the traveler, a difficult task, especially for seniors.²¹
- Color - the choice of color is important. Seniors may have trouble discerning pastels and color intensity. Changes to the eye as we age may make it difficult to distinguish certain color combinations.²²
- Text size - the size of the text should be large enough to allow for easy reading.
- Complexity - way finding maps that try to display three dimensional space are often too complicated to interpret. Furthermore maps that attempt to convey too much information may also be confusing.

Even with simplified “You Are Here Maps,” seniors may still prefer direction from a human volunteer; or receive confirmation from a volunteer that they are pursuing the right path. In this regard volunteer programs that position guides throughout the airport are particularly helpful. Most large airports throughout the United States have some type of volunteer program to assist passengers finding their way in terminals; but the uniforms worn and the procedures used vary from one airport to another. Some sort of standardization – uniform, badge, insignia --to enable a volunteer to be immediately recognized regardless of the airport, would heighten the visibility of these individuals. It would also make more people recognize the existence of these types of volunteers and promote the program.

A particularly important wayfinding issue is the need for appropriate terminal lighting. Lighting should be of adequate intensity while avoiding glare. More research needs to be conducted to develop illumination standards for airport terminals.

Arrival and Check-In

A major problem confronted by senior passengers arriving at the airport is accessing the terminal. The point at which he/she accesses the terminal depends upon the type of transportation used to reach the airport. The passenger driving to the airport will need to find a place to park before proceeding to the terminal. Parking in a long-term parking lot on or off airport property, will then require the use of a transporter, such as a shuttle bus, to reach the departure curb at the airport. The challenge here is being able to board and exit the shuttle bus while transporting baggage. Buses that have an entrance that is at the same level of the curb are ideal. Buses that require negotiating steps can pose a serious problem. The use of boarding platforms could help.

Parking in short-term parking lots in or immediately adjacent to the terminal provides more immediate access but is the most expensive and generally not an option on longer trips. While short term parking may avoid the use of a transporter device to reach the terminal, it is important to find a location that minimizes walking distance to the terminal. The problem is the absence of way finding aids in parking garages. Markings in the garage to identify where to park for accessing certain concourses or airlines, would offer substantial benefits to seniors. Or signs near the doors that provide access to the terminal indicating which concourses or airlines they are nearest would also be of benefit.

In some instances a people mover is available to transport individuals from parking to the appropriate terminal or between terminals. People movers pose a problem when lack of adequate seating requires that the traveler stand. For a senior, standing while the train is accelerating or decelerating, increases the risk of a fall and is anxiety provoking. Consideration needs to be given to adapting the people mover so that approximately 20 to 25 percent of its capacity can offer seating for senior passengers. Such seating could even involve the use of fold down chairs on the perimeter of the vehicle to minimize reductions in capacity when not needed.

Individuals accessing the airport via taxi, van, or public transportation will generally be taken to and disembark at the departure area. At the departure area an individual has two choices if he/she plans to check baggage: check baggage at the curb, or at the ticket counter inside the terminal. Both options present potential problems where a person is subjected to lengthy queues.

One potential solution to this problem is to provide a seating area for seniors immediately at curbside or immediately inside the terminal, and adjacent to the ticketing area. This will provide an opportunity for the senior passengers to safely and comfortably wait to meet friends or family who dropped them off at the terminal and then proceeded to park the car.²³

If the senior traveler needs to go to the ticket counter, rather than waiting in line, the individual could be called for processing using some type of priority system based upon his/her arrival time. For example, the person could be provided with a number to secure his/her priority for processing; or could be given a time at which to check in. Once the number was called or the time was reached, the individual could proceed to the curbside or the ticket counter for check-in.

The choice of seats in the terminal need to take into account the unique requirements of seniors. The seats should:

- Be located in such a way as to minimize walking distance to curbside check-in or the ticket counter
- Have arm rests to make it easier for individuals to get up
- Be positioned at a level that facilitates sitting down
- Be adequately illuminated to ensure that the passenger can read while waiting

Using Vending Machines

Today's airports make use of a wide variety of electronic or mechanical devices to dispense items. These devices, depending on their design, may pose problems for use by seniors.

Many airlines have resorted to the use of electronic devices to dispense boarding passes that obviate standing in long lines at the gate. While these devices offer the potential to save time and reduce waiting, lack of standardization among airlines complicates their use. Because seniors may have problems with manual dexterity, the ability to insert a credit card in a machine may be problematic, along with being able to use the touch screen to enter the appropriate information. If the touch screen requires too light or too heavy a touch, it may be difficult to use. Depending upon the size, color and brightness of the characters on the screen, it may be difficult to decipher the instructions.

Standardization of devices that dispense boarding passes would facilitate their use. These standards need to take into account:

- The opening for inserting a credit card or frequent flyer card.
- The height of the device
- The color, size and contrast of the letters on the screen
- The sensitivity of the screen or keyboard to touch
- The simplicity of instructions for use

Newspaper and change dispensers and vending machines that offer snacks may also pose a problem for seniors. Particular issues relate to small coin slots, devices for accepting paper money, placement that requires extensive reaching or bending, keys that are hard to activate, and labels that are difficult to read.

While airport designers are not charged with the responsibility of modifying the devices made by private manufacturers, they can encourage the manufacturer to produce more standardized equipment and ultimately select vendors that will meet those specifications. Furthermore it is incumbent upon airport professionals to attune the airport terminal to the needs of the customer. The absence of suitable vending machines can result in frustration among seniors and deter air travel and airport use.

Traveling to the Gate

Another obstacle confronting the senior traveler in the airport terminal is traversing the distances needed to reach the gate.

Airports are typically multi tiered with different functions performed on different levels. Thus the journey to the gate often involves moving from one terminal level to another through the use of steps, escalators and elevators.

Steps provide the least desirable option for seniors for moving between terminal levels. Research indicates that 30 percent of the population age 75 and older has trouble using steps.²⁴ If steps are used, it would be advisable to paint the top step and the last step contrasting colors as a warning to senior passengers that they are about to descend the steps or approaching the bottom of the steps.²⁵

Escalators also pose problems. Getting on and off escalators can be a safety hazard for seniors, especially those who suffer from balance and gait impairments and/or who use a cane or a walker. If the escalator is to be used, contrasting colors could be provided at the top of the escalator to highlight the point of entry; and at the bottom to provide a warning that the passenger needs to prepare to step off. An audible warning that the end of the escalator is approaching would also be helpful.²⁶

The elevator is clearly the preferable option for moving among terminal levels. Signs need to be in place appropriately to make seniors aware of the availability and location of the elevator as an alternative to the escalator. Often times escalators are used instead of an elevator because they are the closest and most visible option for moving from one terminal level to another; and seniors don't realize that a nearby elevator is available. Elevators also need to be clearly identified by a number to assist in way finding.

Two mobility aids typically exist to assist in reach the gate: electric carts and moving sidewalks. Electric carts offer an advantage in helping seniors traverse long distances without the need to rely on a wheel chair. Two key issues with carts are ease of boarding and disembarking and restrictions on where they can be used. In the terminals carts may not be accessible to all portions of the concourse. Electric carts should be selected based on ease of entry and exit, or some sort of platform can be used to facilitate access. Expanding the areas in which the electric cart can operate avoids the need for a significant amount of walking after exiting the vehicle.

Moving sidewalks are not as helpful as carts because they require standing and may create balance problems as the sidewalk moves or the traveler steps on to or off of the device. For seniors who use walkers, the moving sidewalks may not provide adequate room for travelers who wish to pass on the left. One enhancement would be the use of audible notifications at the moving walkways with directional and clear sound speakers to announce the start and the end of the device.²⁷

While not specifically a mobility aid, the addition of benches or chairs in extended concourse areas without available seating could allow for a place to rest while traveling along the concourse to the gate.

Passing Through Security

The strengthening of security requirements brought about by the terrorist attacks of September 11, 2001 have posed additional problems for seniors, including:

- Waiting in line and prolonged standing
- Removing personal items and items of clothing and placing them in tubs
- Maneuvering baggage onto and off of the conveyer belt for screening
- Walking through the passenger screening devices

To address prolonged wait times, seating should be provided adjacent to the security. Seating may already exist for people waiting for passengers to arrive, but additional seating may be required. Again the design of the seat selected should be attuned to the needs of the senior as described in the earlier discussion. Seniors could be assigned a number based on their arrival time and then ushered through security when the number was called.

Removing personal items and placing them in tubs on the conveyor belt can take some time, be disruptive and provoke anxiety on the part of seniors. It would be particularly helpful to have legible instructional signs above the queuing area clearly explaining what personal items are required to be placed in the plastic tubs for screening.²⁸

Having tables of an adequate size for aging passengers to manipulate their coats and personal items into the tubs and to reorganize their personal belongings after the screening would be of significant benefit. It would also be helpful to have chairs at the security portal that could be used to remove the shoes; and chairs –other than the ones used by TSA Screeners – to put the shoes back on. The chairs could also be used by seniors to sit in during hand searches, rather than being required to stand with arms extended.²⁹

Maneuvering baggage on to the conveyor belts for screening can be difficult. One option for providing assistance would be to make some type of lift device available for hoisting baggage on to the conveyor belt. Other options would be to modify the design of the conveyor belt to make it closer to the floor; or to add an incline to the conveyor belt.

Walking through passenger screening devices can be onerous for individuals who use a walker or a cane and do not want to use a wheel chair. A railing installed near the entry to the screening device could be used to help travelers steady themselves as necessary.

Waiting and Embarking

Once the gate area is reached, it will be necessary to prepare for boarding the aircraft. Because this may involve a wait, adequate seating needs to be provided for seniors. The seats should be located adjacent to and in full view of the gate area.

While the process for boarding an aircraft may be intuitive to some, others may not realize whether they need to check in at the counter. Instructions could be provided regarding the boarding process, including where to stand in line or to go for priority processing. Often times, gate agents make boarding announcements that are difficult to hear especially with competing terminal noises. It is suggested that text based messages supplement the audio announcements, and that terminal acoustics be evaluated and enhanced where feasible.

To avoid lengthy waits in line, seniors could continue to be given priority in boarding, already a common practice. Seniors could also be seated in a specially designated area and then called individually to board the aircraft using some type of system which recognizes the time at which the traveler reached the gate.

Entering the aircraft via the boarding bridge poses hazards making seniors susceptible to falls. The downward slope of the boarding bridge together with a reduction in lighting from the terminal could make a senior more susceptible to a fall. It is suggested that higher illumination levels in the boarding bridge be considered.

Arrival at Destination Airport

When the senior passenger arrives at the destination airport, a different set of problems are encountered from those that manifest themselves on departure.

Leaving the airplane to enter the gate area, generally involves the use of a jet bridge with a relatively steep slope. Ascending the bridge may be difficult and require some assistance on the part of airline personnel.

When the passenger enters the terminal, he/she is more likely to be spatially disoriented than at the originating airport for two reasons. First the passenger is likely to be less familiar with the destination airport; secondly there generally is a lack of maps in the concourse to identify where you are compared with where you want to go.

The presence of signs providing directional information to the baggage claim area, ground transportation or hotels is vitally important. Signs must be positioned so that they can be easily seen and interpreted immediately upon emerging from the passenger bridge to the gate area. The signs also need to be easy to decipher. This not only involves using large enough print, but also choosing color combinations that can be readily distinguished.

A supplement to signage is the use of volunteers or gate agents to provide personal directions. The presence of a individual to provide direction may provide a greater sense of security.

Baggage Handling and Retrieval

Three potential problems may arise for the senior air traveler in the baggage claim area. These include:

- Finding the proper carousel for retrieving the baggage
- Waiting for the baggage to arrive
- Retrieving the baggage from the carousel or conveyor belt

Finding the proper carousel requires designation with numbers or by airline, overhead signs that clearly display flight numbers and instructions on finding the appropriate carousel.

Waiting for the baggage to arrive is onerous because of the general absence of seating in the baggage claim area requiring prolonged periods of standing. Consideration needs to be given to adding seating in the baggage claim area or immediately adjacent to it with a clear view of the carousel.

Retrieving the baggage from the carousel or conveyor belt is difficult for the senior who has problems with balance and/or difficulty with grasping and pinching. It is unclear whether any design modification to the carousel is available to solve this problem. While the use of a porter represents one option, another would be to designate senior citizens baggage with a special tag. The tag would indicate that the baggage should be taken from the carousel and moved to an area to make retrieval easier.

Exiting the Terminal

Once baggage is retrieved it is necessary for the senior passenger to proceed to ground transportation. The location of ground transportation adjacent to the baggage claim area generally obviates long walking distances. However, given the broad number of ground transportation choices, it is important that clear signage be provided to indicate where to go to and when you have reached the correct pick-up location.

The path to each exit door should be clearly marked and the exit door itself should be marked with a visible number on both the inside and outside to facilitate curbside pickup for both the passenger and the driver.

Signs that are easy to interpret, making maximum reliance on graphic symbols, should be used to indicate where to go to and where to wait for different types of ground transportation. Seating for senior passengers should be made available at each doorway, both inside and outside, with full view of the arrival drive.³⁰

If the senior passenger is using a rental car, it will be necessary to use steps to board and exit a shuttle bus with steps while transporting baggage. Platforms or assistance in boarding or exiting the shuttle bus would offer benefits to the senior traveler.

Where the rental car parking garage is in the terminal, problems arise with congestion and difficulties exiting the structure. The location of joint rental car facilities at less congested off airport sites makes it easier to access the roadway network.

CONCLUSIONS AND RECOMMENDATIONS

In the next ten to twenty years a burgeoning group of seniors will emerge who will have the time and money to fly, but may be reluctant to do so because of the onerous nature of airport terminals. Adapting airports to meet the needs of seniors in a way that allows them to remain independent will be of benefit to all stakeholders involved. It will: enable seniors to maintain their quality of life; provide airports with the revenue needed to maintain and operate their facilities; and offer airlines a way to fill their aircraft and increase their return on investment.

The research conducted in this report represents a starting point for defining the problems that seniors confront at airports and making airport professionals aware of the nature of these problems. Only then can we begin to implement the kinds of terminal adaptations that will make the structures easier to use by seniors. A summary of the terminal enhancement recommendations in this report is contained in Table 2.

More work needs to be done to enlist the support of airport professionals for adapting airport terminals to meet the needs of seniors and to identify more precisely the kinds of improvements that will make airports more usable. This includes, but is not limited to:

- Conducting more senior citizen focus groups at airports across the United States to obtain direct customer input on the problems with airport terminals and potential solutions. The private sector makes extensive use of focus groups to guide the development of its products and services and the public sector could use this same approach for determining how best to accommodate the needs of seniors at airports.
- Subjecting airport professionals to the changes that accompany aging by using equipment, devices and clothing that confine their movement, senses, and stability; and then having them try to perform the various activities needed to travel from the point of arrival to the aircraft gate. Just as Ford Motor Company has its young designers wear a Third Age Suit to better understand the problems of senior drivers, airport professionals could benefit from a similar approach.
- Performing additional tests to more precisely link the changes that accompany aging to specifications for terminal enhancements.
- Conducting additional research on illumination within the terminal and developing illumination guidelines for different functions and different parts of the terminal.
- Working with a national standards group in conjunction with airport stakeholders to develop a set of design standards for seniors at airport terminals; or to incorporate such standards into

universal design standards. Many of these standards would also be applicable to other transportation terminals and public facilities in general.

- Collecting regular information on the number of air trips taken by seniors in order to be able to monitor changes in the propensity to use air travel over time; and to potentially measure whether changes to the airport terminal to make it more conducive to use by seniors, actually increases the number of trips taken.

Enhancing airport terminals making it easier for seniors to fly enables them to enjoy the benefits of air travel and to enhance their quality of life. More important is that these enhancements improve the travel experience for everyone.

Table 2
Summary of Enhancements to Airport Terminals by Function

Function	Enhancement to the Terminal
Instructions and Wayfinding	Orient “You Are Here” Maps with the axis of the environment, select color combinations of sufficient contrast and avoid use of pastel colors; use text on the map of sufficient size and make maps as simple as possible
Arrival and Check-In	Use shuttle buses that have entryways at curb level or provide a platform to assist in boarding the bus; add more seating to people movers – about 20 - 25 percent of capacity; add maps and way finding aids within terminal parking garages and parking lots; provide seating curbside and/or immediately inside the terminal for seniors who use curbside check-in; provide seating near ticket counter;
Using Vending Machines	Work with manufacturers to consider design features that will standardize boarding pass machines and make them easier to use in terms of inserting a credit card or frequent flyer card, the color, size and contrast on the text on the screen, sensitivity of the screen or keyboard to touch and simplicity of instructions for use; work with manufacturers of other vending machines to consider design features that will address issues such as size of the coin slot, ease of extracting product from the vending machine, and the size of the labels or text designating product choices.
Traveling to the Gate	Paint first and last steps contrasting colors to signify the beginning and exit point of the stairway; use audible announcements at the moving walkways to provide advance warning of entry and exit points; select electric carts that are easy to board and exit; add benches in concourses as resting points where nearby seating is not already available.

Passing Through Security	Provide seats adjacent to security; add legible instruction signs above the queuing area explaining what personal belongings are required to be placed in the plastic tubs; add chairs at the security portal that can be used to remove shoes and chairs once security is cleared that can be used to put on the shoes; add larger tables for manipulating personal belongings; provide lifts to facilitate hoisting baggage on security screening conveyor belts or redesign the conveyor belts to enable the baggage to enter the device closer to floor level; place a railing near the entry to the passenger screening device.
Waiting and Embarking	Provide seats adjacent to and in full view of the gate area; provide clear instructions for boarding the aircraft; add text messaging to complement audible messages; increase lighting in the boarding bridge.
Arrival at Destination Airport	Add more and improved signs providing direction to baggage claim or ground transportation; add volunteers at gates or use airline personnel to provide directional guidance; consider location of off-airport rental car facilities in locations that will make it easier to access the roadway network.
Baggage Handling	Add seats in the baggage claim area; provide a method for moving baggage from the conveyor belt to the ground to facilitate baggage retrieval.
Exiting the Terminal	Mark path to exit door and place numbers on the inside and outside of doors; make maximum reliance of symbols on signs; provide seating near each doorway.

Notes

1. Observation is based upon interviews with seniors over a three year period in airports across the United States and a focus group held at Phoenix Sky Harbor International Airport on February 22, 2002.
2. Department of Commerce, United States Bureau of the Census projections of population by age. <http://www.census.gov/population/www/projections/popproj.html>
3. Department of Commerce, United States Bureau of the Census, Census 2000, Summary File 1; and the 1995 American Travel Survey extrapolated to 2000.
4. Department of Commerce, United States Bureau of the Census, projections of population by age. <http://www.census.gov/population/www/projections/popproj.html>
5. Department of Commerce, United States Bureau of the Census, projections of population by age. <http://www.census.gov/population/www/projections/popproj.html>
6. 21 million figure was derived by increasing the number of senior air trips in proportion to the increase in the population of people 65 years and older.
7. The \$120 million figure assumes approximately \$20 per senior passenger trip, based upon enplanement fees, ground access services, and the purchase of goods and services at the terminal. The \$900 million figure assumes an average one way air fare of \$150 based on an analysis of Air Transport Association statistics on air fares by stage length.
8. Personal comment made to author by William DeCota, Director of the Port Authority of New York and New Jersey at an FAA conference in Washington D.C. in February 2002.
9. The perspective provided is based upon personal remarks made to me by Dr. Joseph Coughlin, Director of the Aging Lab at the Massachusetts Institute of Technology in March 2002 at the Aging and Mobility Conference in Scottsdale Arizona. The observation about seniors tending to deny that they have physical limitations was provided by Dr. Judith C. Tingley, a Phoenix clinical psychologist.
10. Personal correspondence with JA Pike, Ford Motor Company, 2003.
11. Jeffrey Pike, Ford Motor Company, Presentation at the Elderly Mobility Conference in Phoenix, Arizona, March 2002.
12. Focus group held at Phoenix Sky Harbor International Airport on February 22, 2002.
13. National Institute on Aging, The Baltimore Longitudinal Study, 1958 forward.
14. Kahn, Robert L., Rowe John W. Successful Aging: the MacArthur Foundation Study Shows How Lifestyle Choices You Make Now – More than Heredity Determine Your Health and Vitality,
15. Scharlach, Andrew and Robinson, Barrie, Curriculum Module on Aging Process: University of California at Berkeley, School of Social Welfare.
16. Allen, G.L. (1999). Spatial abilities, cognitive maps, and way finding: Bases for individual differences in spatial cognition and behavior. In R. Golledge (Ed.), Way finding behavior: Cognitive mapping and other spatial processes (pp. 46-80). Baltimore: Johns Hopkins University Press.
17. Focus Group at Phoenix Sky Harbor International Airport on February 22, 2003.
18. Mayo Clinic, Rochester Minnesota <http://www.mayo.edu/geriatrics-rst/RFA.html>, Geriatric Medicine: Practical Functional Assessment of Older Persons.
19. Scharlach, Andrew and Robinson, Barrie, Curriculum Module on Aging Process: University

- of California at Berkeley, School of Social Welfare.
20. Gary Allen, University of South Carolina, personal communication.
 21. Gary Allen, University of South Carolina, personal communication
 22. Arditi, Aries, Effective Color Contrast, Lighthouse International www.lighthouse.org.
 23. Bernard Deutsch, Deutsch and Associates Architects, personal communication April 4, 2003
 24. Mayo Clinic, Rochester Minnesota <http://www.mayo.edu/geriatrics-rst/RFA.html>, Geriatric Medicine: Practical Functional Assessment of Older Persons.
 25. Barrie Robinson, miscellaneous personal communication
 26. Bernard Deutsch, Deutsch and Associates Architects, personal communication, April 4, 2003
 27. Bernard Deutsch, Deutsch and Associates Architects, personal communication, April 4, 2003
 28. Bernard Deutsch, Deutsch and Associates Architects, personal communication April 4, 2003
 29. Bernard Deutsch, Deutsch and Associates Architects, personal communication April 4, 2003